

**Regional Workshop on the Changing Global Market and Unconventional Gas
6-8 May 2013, Jakarta, Indonesia**

The challenges for shale gas production in Mexico

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**Asia-Pacific
Economic Cooperation**



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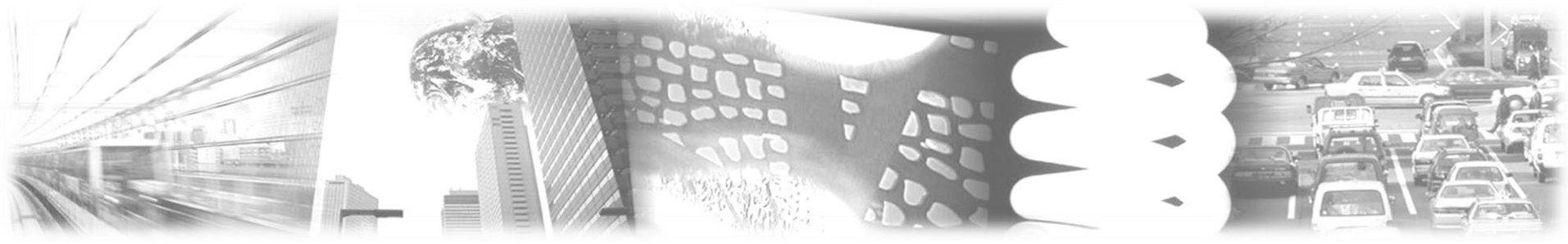
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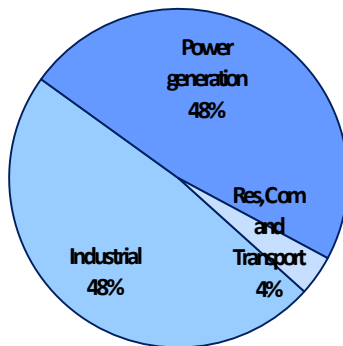
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I. Background

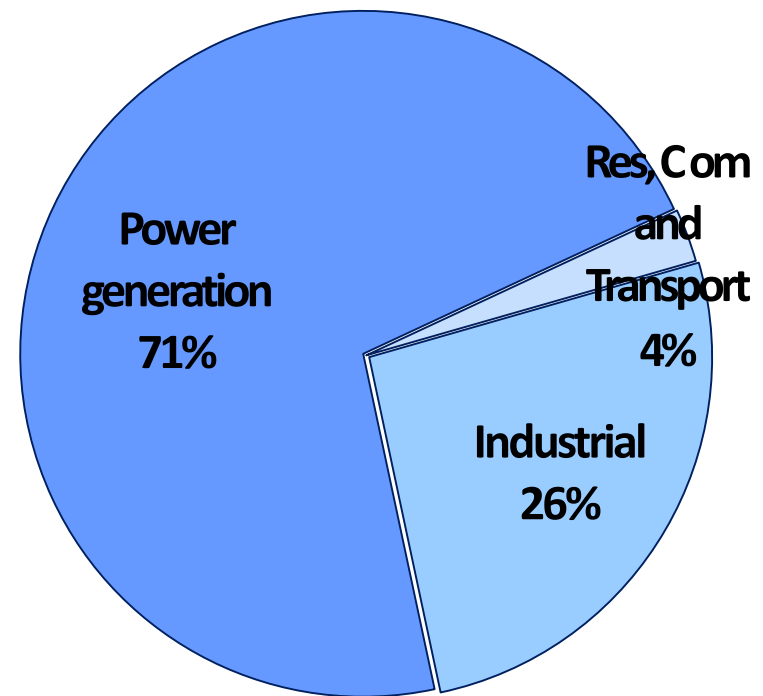


Natural gas demand has been dynamic

- Natural gas end-use demand has doubled from 2000 to 2011.
 - The most rapidly growing sector has been power generation, which has grown at an average rate of 10.7% per year, to represent nearly three quarters of Mexico's demand in 2011.



2000

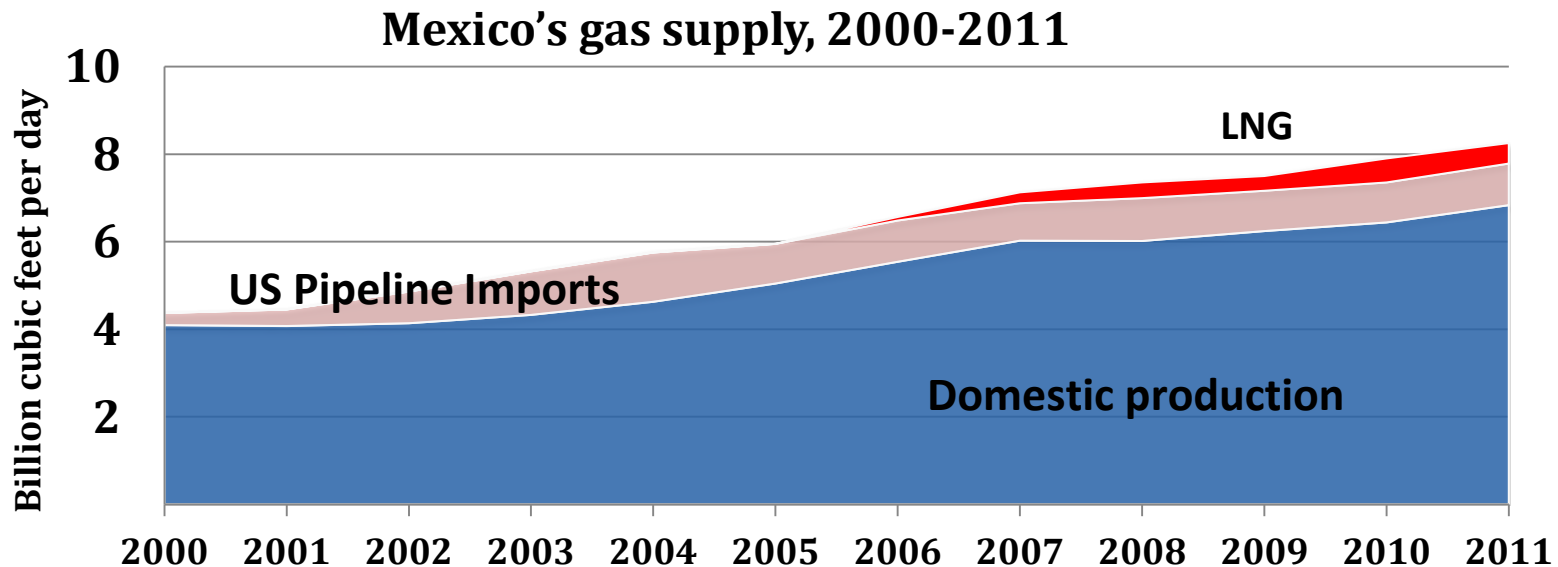


2011

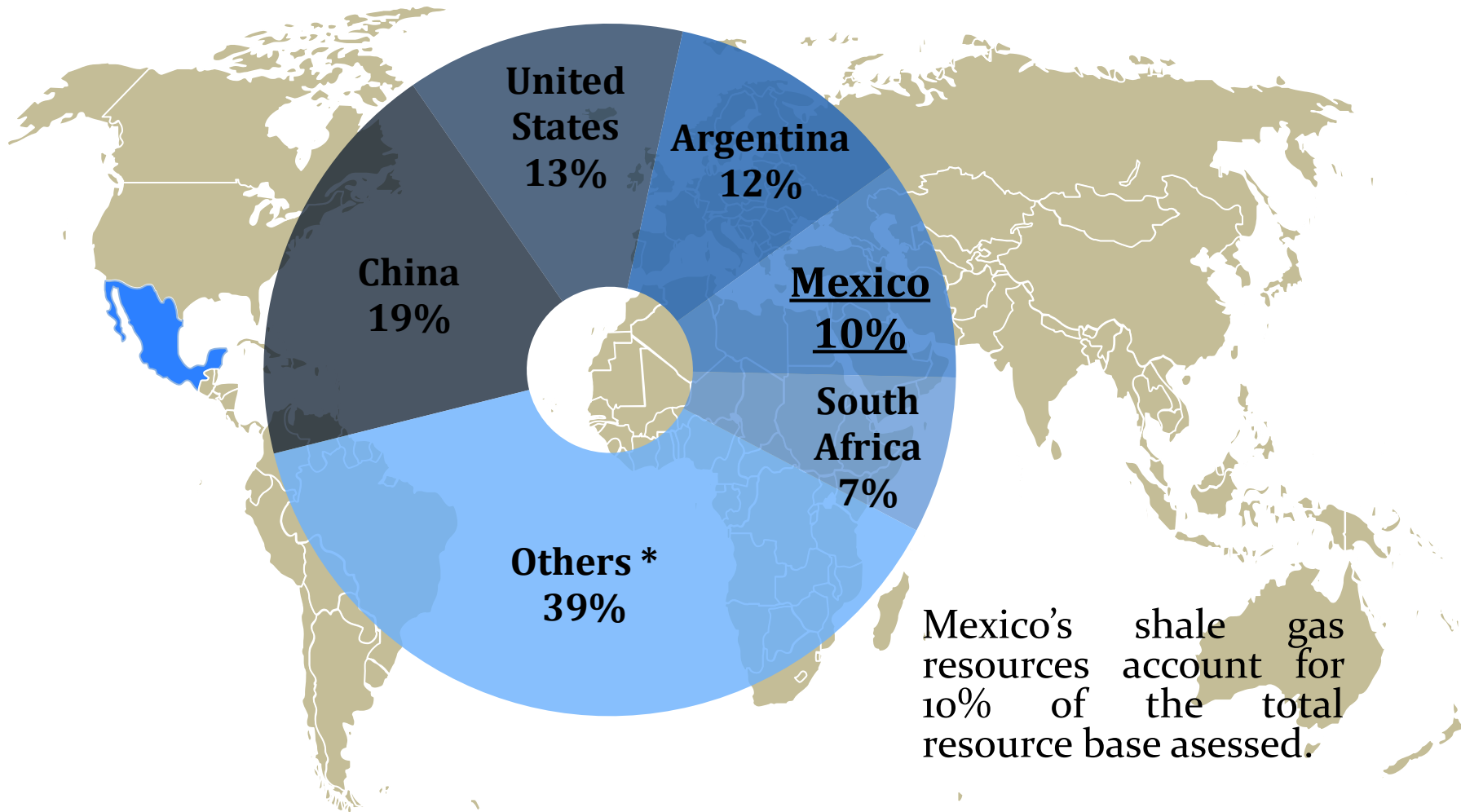
Source: Ministry of Energy (2012)

Domestic production insufficient for demand

- While Mexico's gas production has increased 3.9% from 2000 to 2011, the share of demand met by domestic production has decreased, dropping from 95% in 2000 to 78% in 2011.
 - About 54% of the domestic production is associated to crude oil.
 - To meet its demand, Mexico imports natural gas from the United States by pipeline and also in the form of LNG from the three terminals located at its Pacific and Atlantic coastlines.



Mexico enters the shale gas map



*Refers to other 28 countries
Source: EIA (2011)

North America's shale gas resources

- According to preliminary assessments, North America is the world's most prominent shale gas region, with 1,931 Tcf, **equivalent to 29% of the total resource base preliminarily assessed.**



Source: U.S. Energy Information Administration based on data from various published studies. Canada and Mexico plays from ARI.
Updated: May 9, 2011

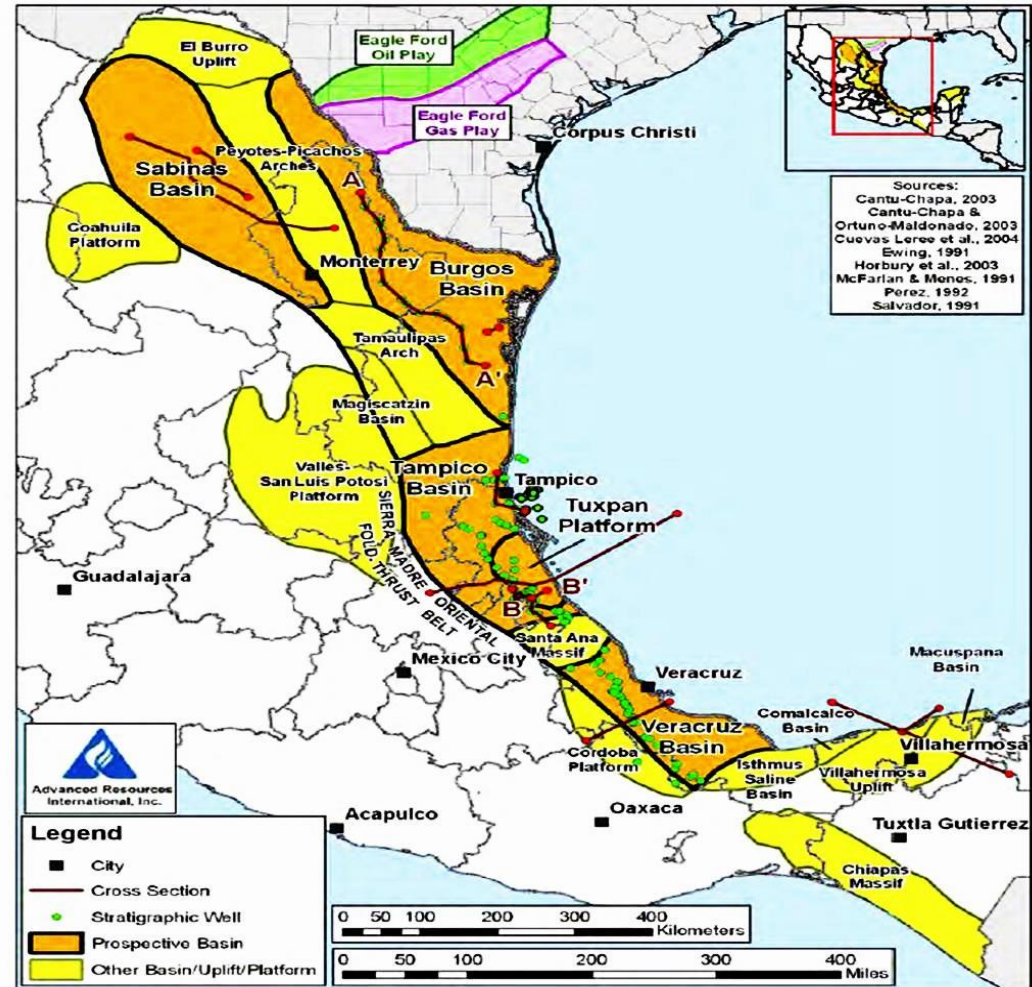
- Some of the shale formations span the borders between countries.

Mexico's shale gas: preliminary assessment

- According to the EIA, Mexico's technically recoverable shale gas resources are mainly located in the northeast and Gulf coastline of its territory.
- Four major basins were identified:
 - Sabinas
 - Burgos
 - Tampico
 - Veracruz

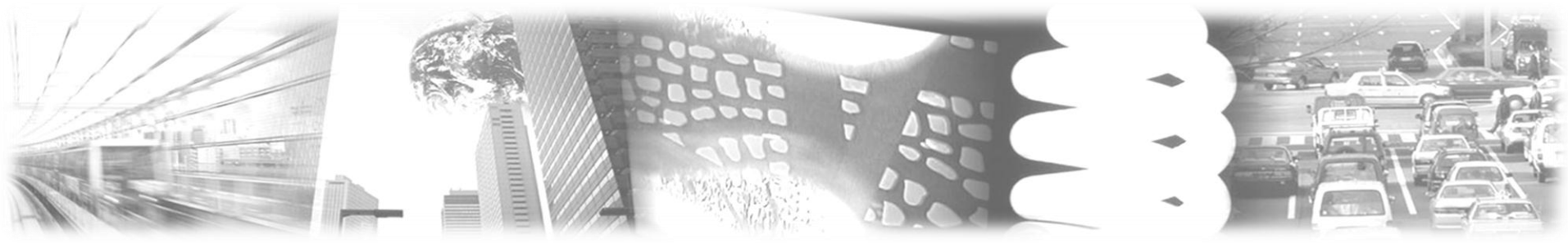
Figure II-1. Onshore Shale Gas Basins of Eastern Mexico's Gulf of Mexico Basin.

Cross-section locations are noted



Source: EIA (2011)

II. Milestones



Shale gas becomes an energy planning priority

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2012-2026



FEBRERO DE 2012

- During 2011, the enthusiasm from the Mexican authorities had been growing, with workshops and official speeches addressing the role of shale gas as a game-changer in the economy and the energy sector.
- By February 2012 for the first time ever, Mexico's Energy Strategy 2012 included shale gas in its national energy planning.

Energy Strategy 2012: Early potential estimates

- In comparison with the assessment from EIA, a new shale basin was added in northern Mexico (Chihuahua).
- The potential resources in these five major basins were estimated as being between **150 and 459 Tcf**.
- In 2011, the first exploratory well of shale gas was drilled, being successful as a commercial producer.



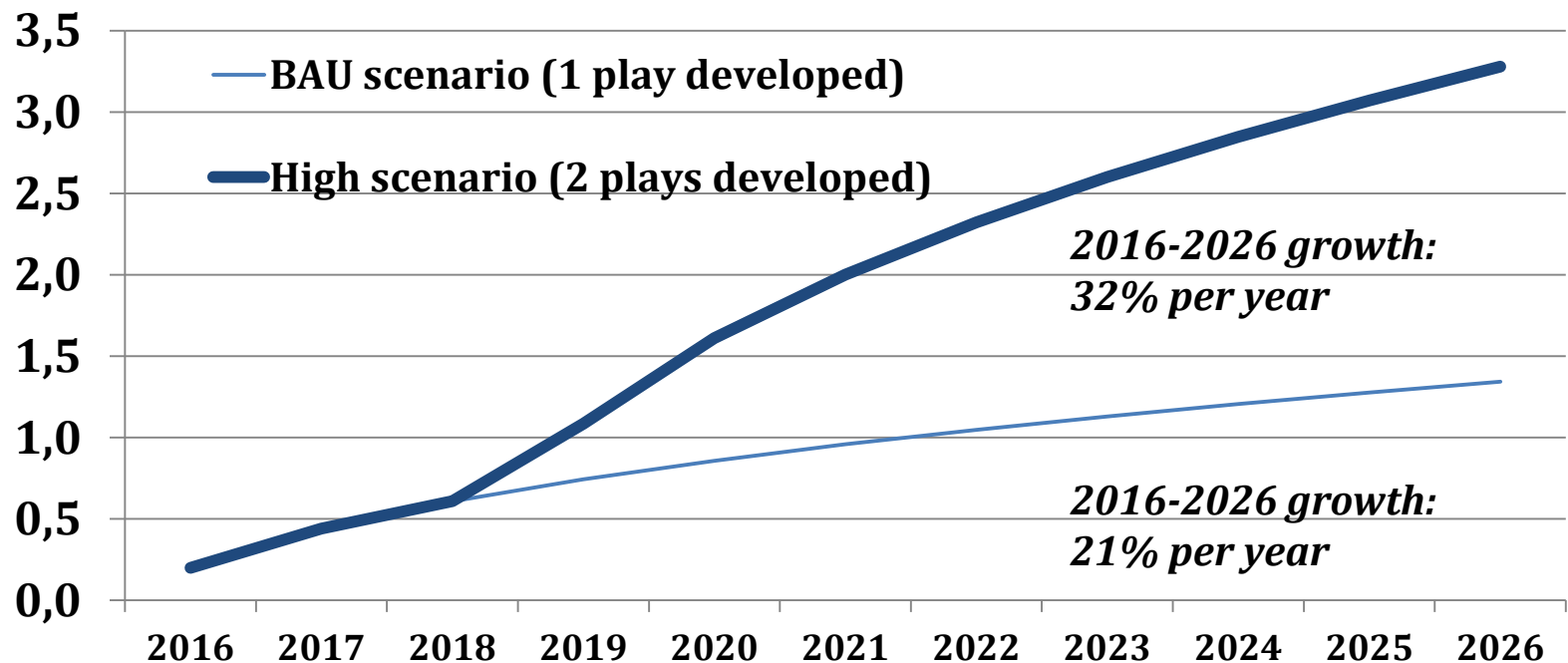
Source: Mexico's Energy Strategy (2012)

Energy Strategy 2012: Shale gas production considered

- Two scenarios of shale gas production starting from 2016 were included in the Energy Strategy 2012.
 - In the BAU scenario **only one shale gas play would be developed:** an extension of the Eagle Ford basin spanning the border with the USA.
 - In the High scenario **an additional play was to be developed.**

Energy Strategy 2012: Shale gas production scenarios

- For each scenario, shale gas output by 2026 could amount to as much as 1.3 Bcfd and 3.3 Bcfd, respectively, equivalent to 15% and 29% of Mexico's production.



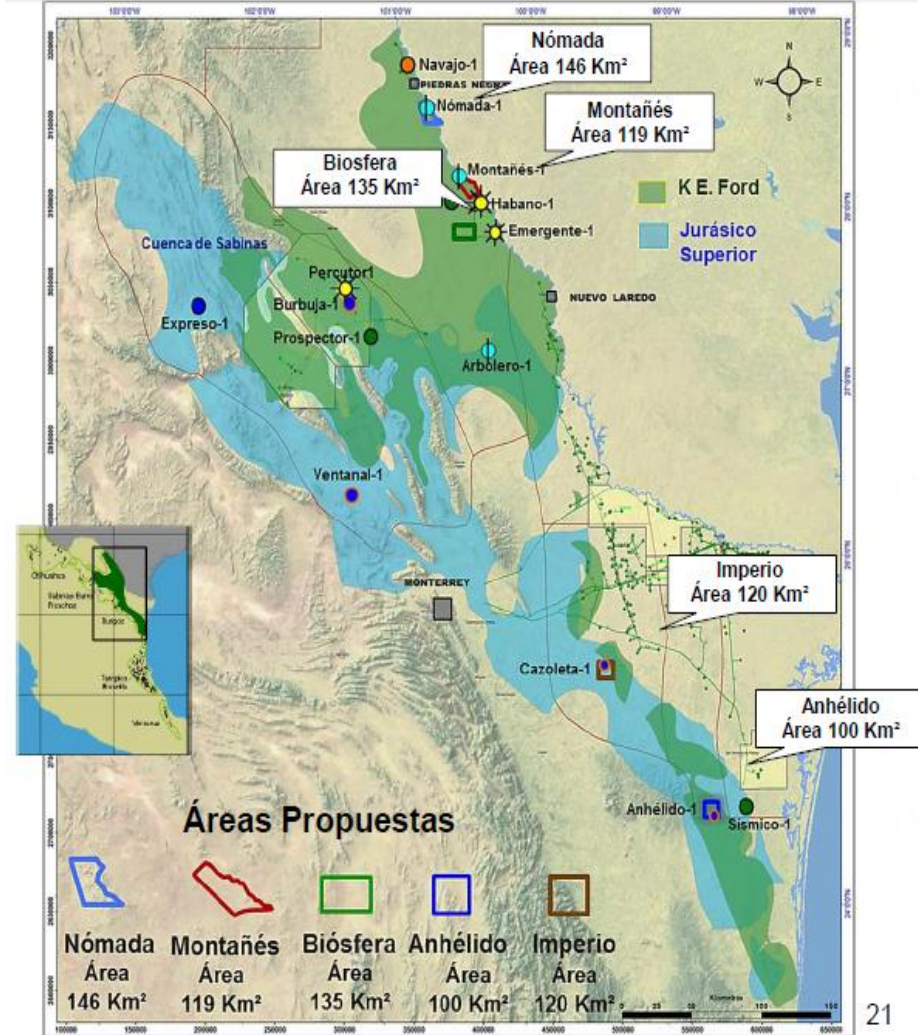
Source: Mexico's Energy Strategy (2012).

Operational results

- In spite of having set a target of drilling 20 exploratory wells up to 2014, up to February 2013, only seven shale gas wells had been drilled in Northern Mexico.
- Some of them were successful as commercial producers with only one being hitting oil. After two years producing, the output of the first well (Emergente) has fallen 70%.

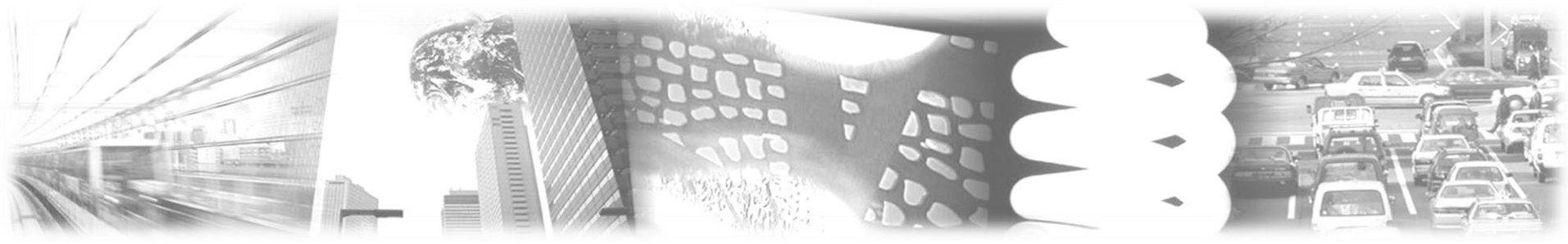
Well	Location (State)	Status	Product	Total depth (meters)
Emergente	Coahuila	Commercial	Dry gas	4,071
Percutor 1	Coahuila	Commercial	Dry gas	3,436
Habano 1	Coahuila	Commercial	Gas/condensate	3,770
Montañés 1	Coahuila	Non-commercial	Gas/condensate	3,200
Nómada 1	Coahuila	Not succesful	-	2,850
Arbolero 1	Nuevo León	Commercial	Dry gas	4,007
Anhérido 1	Tamaulipas	Commercial	Oil and gas	3,945

Source: National Hydrocarbons Commission



Source: Pemex

III. Challenges



The United States as a role model

- Because of its success as the only major developer of shale gas so far, **the United States is generally regarded as the major role model to guide shale gas development internationally.**
- However, **its success has not yet been replicated elsewhere**, which calls for a better understanding of the underlying success factors.
- The knowledge eventually gained could lead to **policy-making adapted to the unique institutional environment** of other countries, as well as an **approximate assessment of the timeframes and resources that will be required.**

Shale gas challenges are recognized



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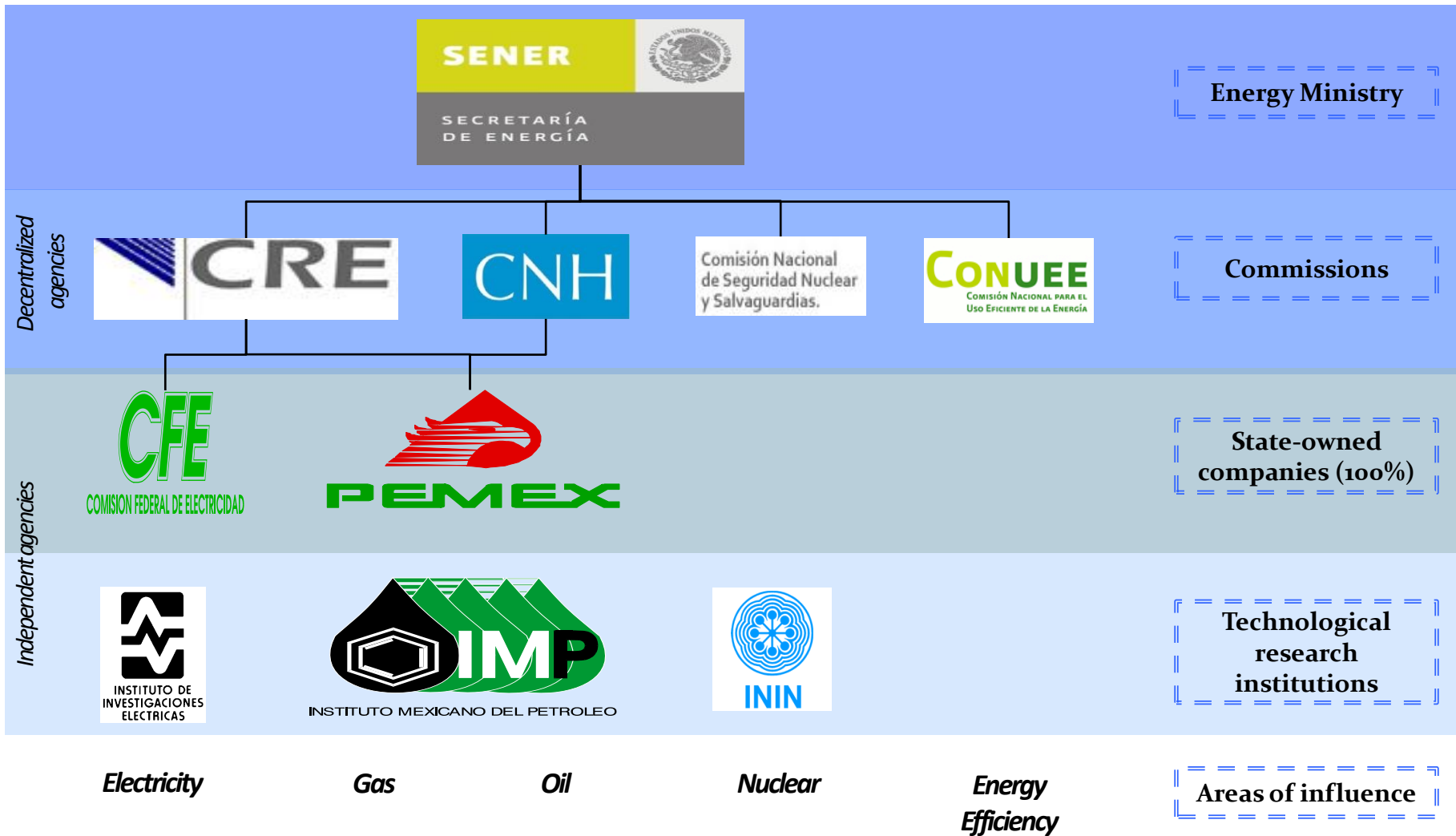
2013-2027

- Under Mexico's new administration, the latest edition of the National Energy Strategy is more reserved with its shale gas outlook.
- No shale gas production scenarios have been included.
- It is stressed that **the likely slow pace of development is bounded by Mexico's current legal and economic framework.**
- More favorable opportunities may arise **provided that special promotion measures are adopted.**

Institutional challenges: Mexico's legal framework

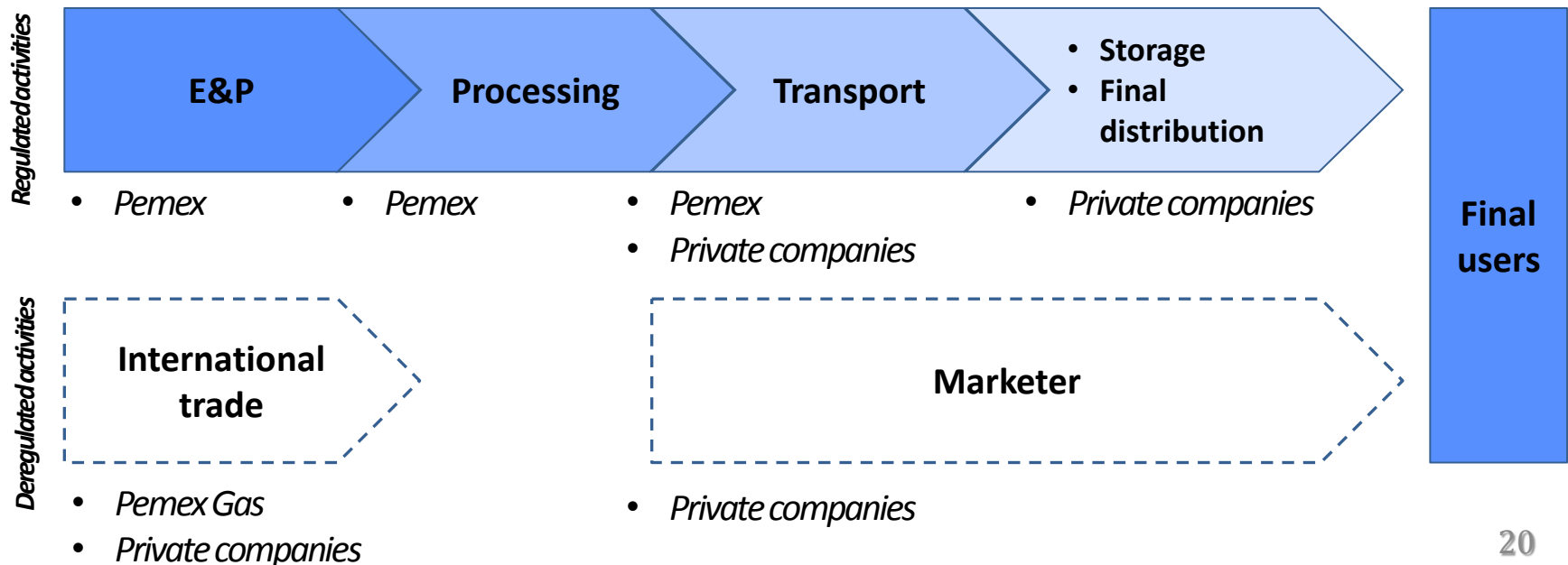
- Under the Mexican Constitution, the State is the only owner of the hydrocarbons in the subsoil.
- Moreover, the exploitation of those resources is to be carried out exclusively by its state-owned company **Pemex**, which operates in both oil and gas.
 - Pemex is allowed to sign contracts for services with private participants, however, any scheme other than simple payment for services, such as production sharing or joint-ventures, **is forbidden**.
 - In the practice, **private participation is very limited**, with private participants not allowed to collaborate with Pemex other than as subcontractors.

Institutional challenges: Mexican energy sector structure



Institutional challenges: Mexico's natural gas industry

- Compared to oil, the Mexican natural gas market has allowed relatively more private participation and lighter regulation.
 - Pemex is still present in most activities, although private investments in distribution and storage (such as LNG) have occurred. More recently, private companies have also been undertaking transport and limited upstream activities under special multiservice contracts.
 - Mexican gas prices are regulated by the Energy Regulatory Commission and linked to the Henry Hub.



Economic challenges: Pemex's financial limitations

- The current taxation regime skims off a major share of Pemex's profits, with taxes typically representing more than 65% of its profits.
- These resources provide nearly one third of the government's revenue.
- The heavy taxation of Pemex has led to **chronic underinvestment** and a **loss of competitiveness**

Year	Taxation as % of Pemex's total revenues	Oil tax revenues as % of total government revenue
2000	67%	33%
2001	66%	30%
2002	50%	30%
2003	61%	33%
2004	68%	36%
2005	74%	37%
2006	65%	38%
2007	60%	35%
2008	72%	37%
2009	56%	31%
2010	63%	33%
2011	68%	34%
2012	67%	34%

Source: Bank of Mexico (2013)



Economic challenges: Pemex's financial limitations

- Due to Pemex's financial constraints and the scale of its operations as a state-owned monopoly:
 - Pemex is unable to meet all its demands effectively and to improve its operational efficiency.
 - Projects have not been undertaken or been delayed.
 - As a cash cow of the Mexican government, short-term profitability is the driving rationale for most projects, leading to neglect options with higher value in the long-term.

Technical challenges: Lower resource estimations

- In spite of Mexico still not having any confirmed assessment of its shale gas resources, its preliminary estimations have reduced the shale gas resource base.

Mexico's shale gas resource estimations			
Chronological order	Source	Resources (Tcf)	Variation from (1) (%)
(1)	EIA, 2011	681	-
(2)	Mexico's National Strategy 2012*	459	-33
(3)	Mexico's National Strategy 2013	142	-79

* Refers to the upper limit of estimations.

- In October 2012 it was announced that a geological assessment of shale gas resources was to be carried out by the Mexican Petroleum Institute. The project, worth 244 million dollars, was financed from a public trusting fund and will be in force up to 2016.

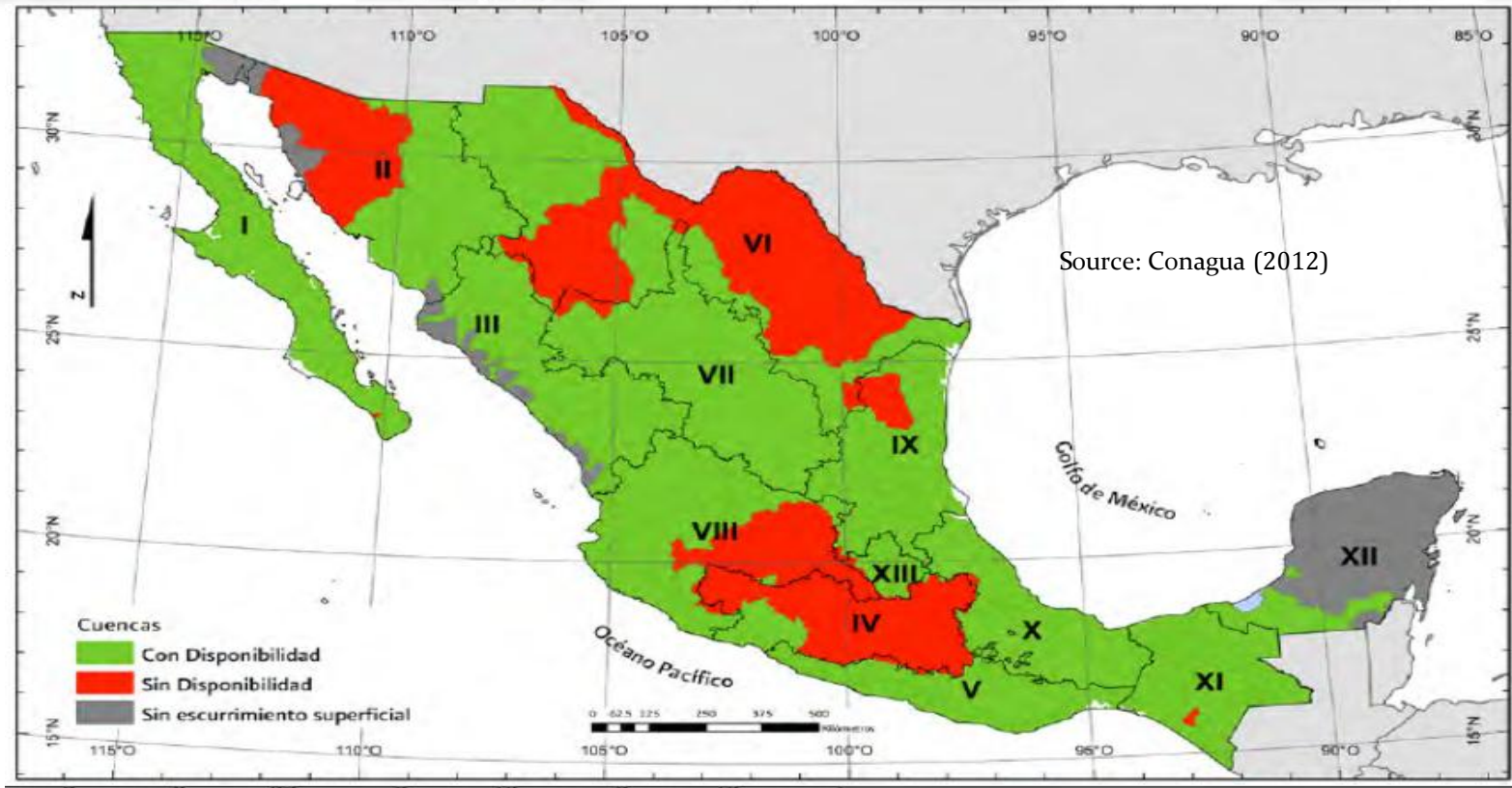


Technical challenges:

Lack of technology and operational capacity

- Given Pemex's tight budget and chronic underinvestment, it has been unable to invest in the technological and operational capabilities to develop shale gas.
- In the practice, it depends on the numerous subcontractors that provide technology, equipment and personnel.
- Lack of specialized human resources due to natural overturn, overemployment on administrative areas and the workers' union pressures have combined to limit technology access and assimilation.

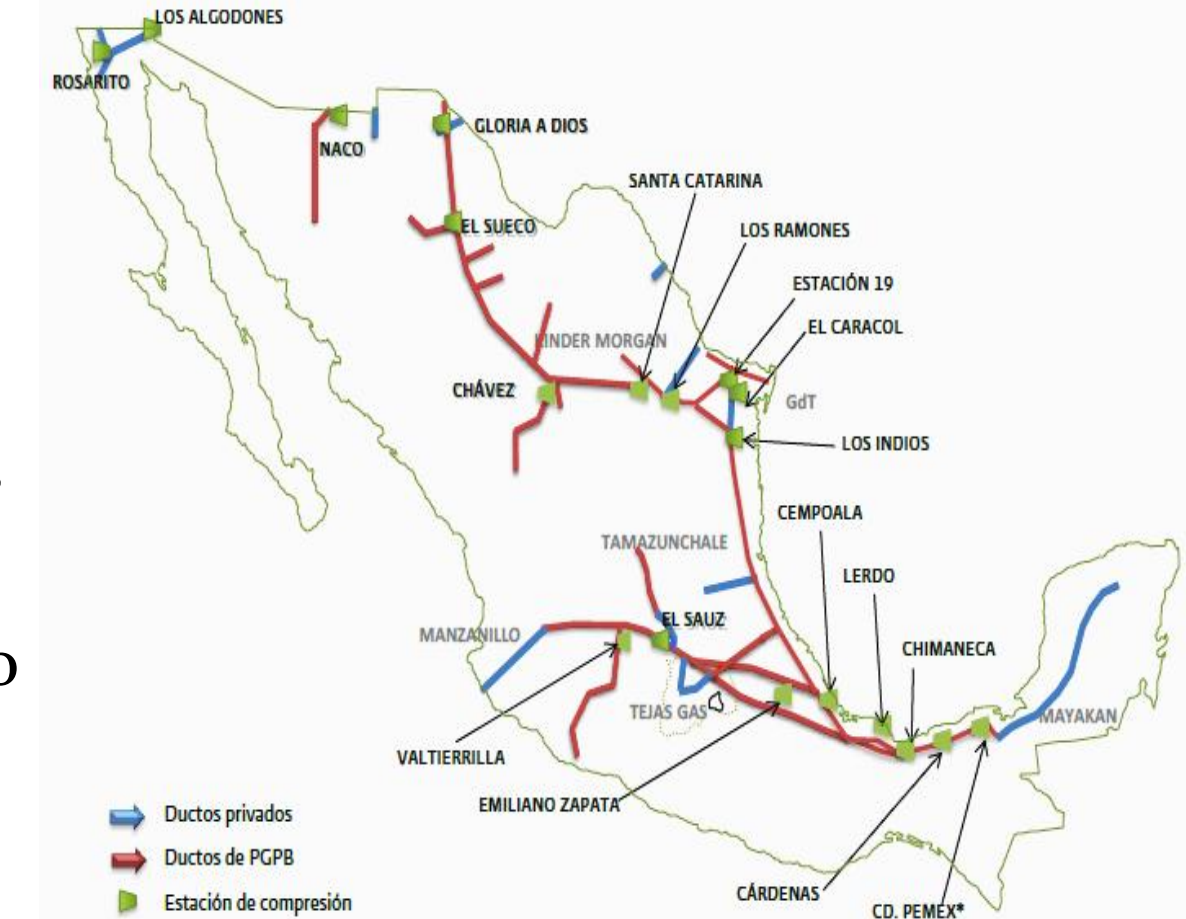
Technical challenges: Water scarcity for hydraulic fracturing



- In large areas of northern Mexico where shale gas plays are present, water availability is deemed as inadequate by federal water authorities.

Technical challenges: Limited infrastructure

- While in recent years the pipeline lines owned by private participants have expanded the national network, its overall length and capacity are still insufficient to take gas across the territory and delivery it to the main demand centers.



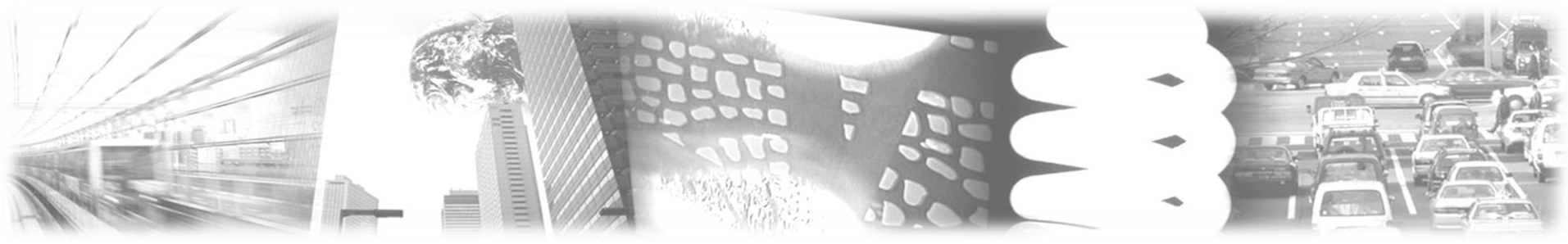
Source: Ministry of Energy (2012)



Structural deficiencies taking their toll

- Due to the regulatory linkage of Mexico's natural gas price with the Henry Hub, and declining trend of the Henry Hub price in recent years, natural gas demand has surged, especially in the industrial sector.
- However, due to limited pipeline capacity, no more imports from the United States were available, leading to a generalized shortage of gas that still persists.
- These bottlenecks had led to the discontent among industrial users, who cannot get more gas in spite of the lower prices and who cannot improve their competitiveness.
- These structural deficiencies hinder the outlook for shale gas development and illustrate the profound divergences between the natural gas markets of Mexico and the United States.

IV. Conclusions

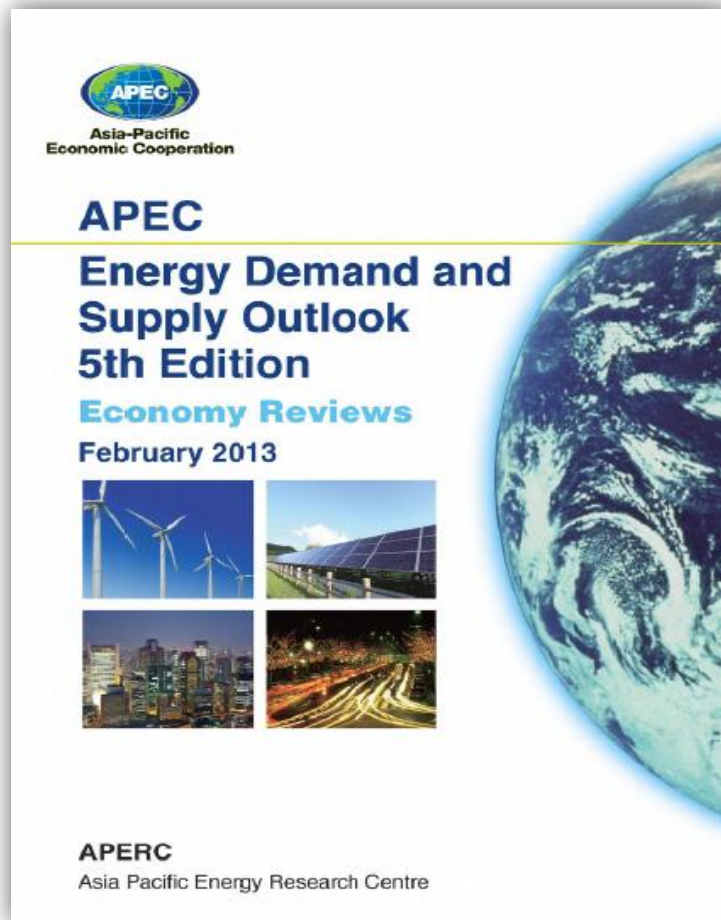


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Highlights

- In spite of the initial hype and optimism from the inferred resources, in the practice **shale gas production is very challenging, especially if market structure is not optimal.**
- Achieving the kind of results observed in the United States seems very complex due to the institutional differences between countries; the example of the United States can be useful for Mexico if Mexico can **understand the policies involved and adapt them into of policies appropriate to its own environment.**
- In addition to the existence of resources, for shale gas to be produced, **careful planning is required.**
- **Financial and technical capabilities, infrastructure, regulation, governmental support and favorable market dynamics** are factors conducive to commercial shale gas development.

APERC's *Energy Supply and Demand Outlook*



- These issues are briefly discussed in Volume II of APERC's *Energy Supply and Demand Outlook 5th Edition*, issued last February.
- The document can be accessed at:

<http://aperc.ieej.or.jp>

Thank you

